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| 10/030,732 | 01/08/2002 | Hideo Nakajima | SAEGU97.001APC | 8246 |

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| EXAMINER |
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KERNS, KEVIN P

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| ART UNIT | PAPER NUMBER |
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1725

DATE MAILED: 08/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/030,732

Applicant(s)

NAKAJIMA, HIDEO

Examiner

Kevin P. Kerns

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 July 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,8 and 10-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,8 and 10-20 is/are rejected.
- 7) ☒ Claim(s) 18 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 18 is objected to because of the following informalities: in the last line, "allowys" should be changed to "alloys". Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 12-14 and 16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 12 and 16 recite the limitation "the resultant molten metal". There is insufficient antecedent basis for this limitation in the claims. It is suggested to replace this limitation with "the molten metal".

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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5. Claims 1, 2, 8, 12, 14, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shapovalov (US 5,181,549) in view of JP 5-59462, and further in view of JP 3-17236 (see complete translation of Japanese text).

Shapovalov discloses a method for manufacturing porous metallic articles, in which the method includes the steps of melting a raw metal material, including copper, iron, nickel, magnesium, and various alloys (column 6, lines 62-68) under a wide range of pressures between 0.1 and 10 MPa, inclusive of pressures between 0.2 and 2.5 MPa (column 7, lines 3-13), such that the pressurization gas includes hydrogen gas (column 4, lines 27-61); and providing cooling while controlling gas pressure to the molten metal (after pouring into the mold) to enhance directional solidification in the mold inside the sealed vessel (autoclave 10) to form the cast metal porous body product (abstract; column 2, lines 42-68; column 3, lines 1-15 and 58-68; column 4, lines 1-68; column 5, lines 1-65; column 6, lines 46-68; column 7, lines 1-68; and Figures 1-8). In addition, Shapovalov discloses that other gases may be used, such as a hydrogen-based mixture, wherein another gas of the mixture reacts with the raw metal material to produce a desired quality in the resulting material or product (column 4, lines 30-36). Shapovalov does not specifically disclose the step of maintaining the raw metal material under a reduced pressure at a preheating temperature just below the melting point of the metal, nor does Shapovalov disclose the use of nitrogen gas and/or one or more gases as pressurization gas/gases.

However, JP 5-59462 discloses a method of producing high purity copper, with the method including evacuating a high vacuum vessel to less than 10^{-3} torr pressure

while heat treating/degassing the copper in a temperature range between 500 and 1,000 degrees Celsius (below the copper melting point) for more than 1 hour, for the purpose of degassing the metal, and thereby obtaining a high purity (copper) metal product (abstract).

It would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the method for manufacturing porous metallic articles, as disclosed by Shapovalov, by adding the step of operating at a reduced pressure at a preheating temperature just below the melting point of the metal, as taught by JP 5-59462, in order to degas the metal, and thereby obtain a high purity (copper) metal product (JP 5-59462; abstract).

Neither Shapovalov nor JP 5-59462 discloses the use of nitrogen gas and/or one or more gases as pressurization gas/gases.

However, JP 3-17236 discloses a method of manufacturing foamed metal, in which the method includes providing fine gas bubbles uniformly dispersed over the whole of the metal, in which the gas bubbles are created by a step of dissolving a soluble gas such as hydrogen and nitrogen (see abstract) into molten metal, for the purpose of obtaining a foamed metal in a uniform foaming state (abstract; pages 1-5 of translation; and Figures 1-3).

It would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the method for manufacturing porous metallic articles, as disclosed by Shapovalov, by adding the step of operating at a reduced pressure at a preheating temperature just below the melting point of the metal, as

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taught by JP 5-59462, in order to degas the metal, and thereby obtain a high purity (copper) metal product, and by further using hydrogen and nitrogen as the pressurization gas to form the foamed metal, as disclosed by JP 3-17236, in order to obtain a foamed metal in a uniform foaming state (JP 3-17236; abstract; and pages 2 and 5 of translation).

6. Claims 1, 2, 8, and 11-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shapovalov (US 5,181,549) in view of JP 5-59462, and further in view of Apfel (US 5,384,203).

Shapovalov (in view of JP 5-59462) disclose and/or suggest the features set forth in paragraph 5 (including the concept of a mixture of gases), with the exception of the use of nitrogen gas and/or one or more gases as pressurization gas/gases.

However, Apfel discloses a method of producing foam metallic glass, in which the method includes using nitrogen or argon gas flooded into the top chamber 12 of the pressure cell 10, such that the nitrogen and argon gases are advantageous for suppressing oxidation in the metal foam (abstract; column 2, lines 28-65; column 7, line 30 through column 9, line 40; and Figures 1 and 2).

It would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the method for manufacturing porous metallic articles, as disclosed by Shapovalov, by adding the step of operating at a reduced pressure at a preheating temperature just below the melting point of the metal, as taught by JP 5-59462, in order to degas the metal, and thereby obtain a high purity

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(copper) metal product, and by further using nitrogen and/or argon, as disclosed by Apfel, in order to suppress oxidation in the metal foam (Apfel; column 8, lines 27-31; and column 9, lines 28-35).

7. Claims 1, 2, 8, and 11-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shapovalov (US 5,181,549) in view of JP 5-59462, and further in view of JP 10-158761.

Shapovalov (in view of JP 5-59462) disclose and/or suggest the features set forth in paragraph 5 (including the concept of a mixture of gases), with the exception of the use of nitrogen gas and/or one or more gases as pressurization gas/gases.

However, JP 10-158761 discloses production of foam having directional pores, in which the production method includes using at least one kind of gases to be dissolved among gaseous H, N, and O, such that these gases are advantageous for producing directional pores in the foam (abstract; and Figures 3-5).

It would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the method for manufacturing porous metallic articles, as disclosed by Shapovalov, by adding the step of operating at a reduced pressure at a preheating temperature just below the melting point of the metal, as taught by JP 5-59462, in order to degas the metal, and thereby obtain a high purity (copper) metal product, and by further using at least one kind of gases to be dissolved among gaseous H, N, and O, in order to produce directional pores in the foam (JP 10-158761; abstract).

8. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shapovalov (US 5,181,549) in view of JP 5-59462, and further in view of JP 3-17236, as applied to claim 1 above, and further in view of JP 3-294437.

Shapovalov (in view of JP 5-59462, and further in view of JP 3-17236) disclose and/or suggest the features of claim 1 (including the concept of a mixture of gases). Neither Shapovalov, JP 5-59462, nor JP 3-17236 specifically discloses that the casting is conducted by a continuous casting method.

However, JP 3-294437 discloses a method and apparatus for manufacturing porous metallic materials, in which the process includes continuously draining slurried porous metal 12 from a drain nozzle 3 to provide continuous casting in the mold below the molten metal 10 in the container, such that the continuously draining/casting of the porous metal is advantageous for continuously obtaining a porous metal product having a wide range of shapes and porosity (abstract; and Figures 1 and 2).

It would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the method for manufacturing porous metallic articles, as disclosed by Shapovalov, by adding the step of operating at a reduced pressure at a preheating temperature just below the melting point of the metal, as taught by JP 5-59462, in order to degas the metal, and thereby obtain a high purity (copper) metal product, by further using hydrogen and nitrogen as the pressurization gas to form the foamed metal, as disclosed by JP 3-17236, in order to obtain a foamed metal in a uniform foaming state, and by further using a continuous casting method, as

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disclosed by JP 3-294437, in order to continuously obtaining a porous metal product having a wide range of shapes and porosity (JP 3-294437; abstract).

9. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shapovalov (US 5,181,549) in view of JP 5-59462, and further in view of either Apfel (US 5,384,203) or JP 10-158761, as applied to claim 15 above, and further in view of JP 3-294437.

Shapovalov (in view of JP 5-59462, and further in view of either Apfel or JP 10-158761) disclose and/or suggest the features of claim 15 (including the concept of a mixture of gases). Neither Shapovalov, JP 5-59462, Apfel, nor JP 10-158761 specifically discloses that the casting is conducted by a continuous casting method.

However, JP 3-294437 discloses a method and apparatus for manufacturing porous metallic materials, in which the process includes continuously draining slurried porous metal 12 from a drain nozzle 3 to provide continuous casting in the mold below the molten metal 10 in the container, such that the continuously draining/casting of the porous metal is advantageous for continuously obtaining a porous metal product having a wide range of shapes and porosity (abstract; and Figures 1 and 2).

It would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the method for manufacturing porous metallic articles, as disclosed by Shapovalov, by adding the step of operating at a reduced pressure at a preheating temperature just below the melting point of the metal, as taught by JP 5-59462, in order to degas the metal, and thereby obtain a high purity

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(copper) metal product, by further using nitrogen and/or argon or by further using at least one kind of gases to be dissolved among gaseous H, N, and O, as disclosed by Apfel and JP 10-158761, respectively, in order to suppress oxidation in the metal foam and to produce directional pores in the foam, respectively, and by further using a continuous casting method, as disclosed by JP 3-294437, in order to continuously obtaining a porous metal product having a wide range of shapes and porosity (JP 3-294437; abstract).

Response to Arguments

10. The examiner acknowledges the applicant's amendment and declaration under 37 CFR 1.132 provided with the request for continued examination, all of which were received by the USPTO on July 14, 2005. A claim objection and 35 USC 112, 2nd paragraph rejections are presented in paragraphs 1 and 3. The applicant has added new claims 15-20. Dependent claims 11 and 13, which had been previously indicated as allowable subject matter, are now rejected in paragraphs 6 and 7 (see new prior art references US 5,384,203 and JP 10-158761). Claims 1, 2, 8, and 10-20 are currently under consideration in the application.

11. Applicant's arguments filed July 14, 2005 have been fully considered but they are not persuasive.

With regard to the applicant's remarks/arguments on pages 6-8 of the amendment, the applicant is referred to the newly underlined portions of paragraphs 5-

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9, as Shapovalov discloses that other gases may be used, such as a hydrogen-based mixture, wherein another gas of the mixture reacts with the raw metal material to produce a desired quality in the resulting material or product (column 4, lines 30-36).

As a result, Shapovalov includes the concept of a mixture of gases. It is noted that this disclosure of Shapovalov (column 4, lines 30-36) was also discussed in the personal interview of June 22, 2005. Furthermore, JP 3-17236 (abstract) discloses hydrogen and nitrogen. The applicant is respectfully requested to discuss the JP 3-17236 translation (enclosed) in view of its comparison with the abstract of JP 3-17236, as the remarks on pages 6-8 do not specifically address the use of hydrogen and nitrogen together of JP 3-17236, and also when taken in view of the concept of gas mixtures of Shapovalov (see newly underlined portions of paragraph 5).

12. Applicant's arguments with respect to claims 1, 2, 8, and 10-20 have been considered but are moot in view of the new ground(s) of rejection (new references US 5,384,203 and JP 10-158761 – see paragraphs 6-9).

Response to Amendment

13. The declaration under 37 CFR 1.132 filed July 14, 2005 is insufficient to overcome the rejection of claims 1, 2, 8, and 10-20 as set forth in the last Office action, for the reasons set forth in paragraphs 5-7 and 11. It is also noted that the criticality of the nitrogen gas used alone in the declaration has not been set forth, but only nitrogen used in mixtures with other gases.

Conclusion

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kevin P. Kerns whose telephone number is (571) 272-1178. The examiner can normally be reached on Monday-Friday from 8:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Dunn can be reached on (571) 272-1171. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Kevin P. Kerns *Kevin Kerns 8/17/05*
Primary Examiner
Art Unit 1725

KPK
kpk
August 17, 2005